

TeV4LHC Workshop

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Single Top results from DØ Planning the writeup



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DØ search strategy

Basic Selection Cuts

1 tag 2 tags

s t s t

Cuts DT NN

Binned Likelihood

s, t and s+t limits

Lepton(e,μ): $p_T > 15$ GeV, $|\eta_{e(\mu)}| < 1.1$ (2.0)

Jets: $2 \leq N_{\text{jets}} \leq 4$, $E_T > 15$ GeV, $|\eta| < 3.4$

Jet1: $E_T > 25$ GeV

MET: $\text{MET} > 15$ GeV

Other clean-up cuts

Require =1 and ≥ 2 SVT/JLIP tags

t-channel: at least one non-b-tagged jet

Multivariate analysis: Simple cuts, Decision Trees, Neural Networks, Likelihood Discriminants

Cut analysis: count events

DT, NN, Likelihood: use 2D output in a binned likelihood

DØ results

$\mathcal{L}=230\text{pb}^{-1}$

Cut-based

Decision Trees

Neural Networks

	Observed	Expected	Observed	Expected	Observed	Expected
s-channel	10.6	9.8	8.3	4.5	6.4	4.5
t-channel	11.3	12.4	8.1	6.4	5.0	5.8

PLB 622, 265 (2005)

$\mathcal{L}=360\text{pb}^{-1}$

Lhood Discriminants

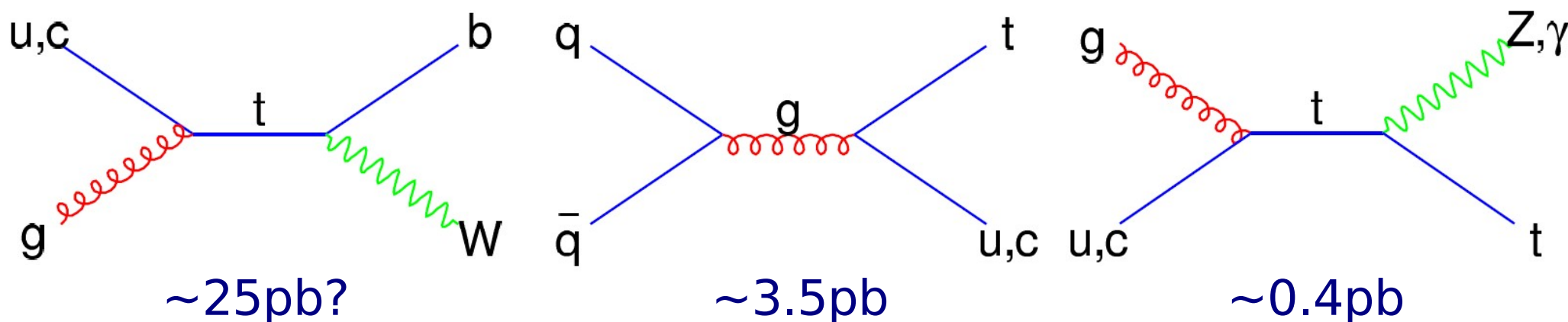
	Observed	Expected
s-channel	5.0	3.3
t-channel	4.4	4.3

- ▶ Loose selection
- ▶ Normalize W +jets estimate from pre-tagged data sample.
Take W_{bb}/W_{qq} ratio from MC (25% uncertainty before tagging)
- ▶ Use Bayesian approach to combine channels (e, μ and 1 tag, 2 tags)
- ▶ Take systematics and correlations into account
- ▶ DTs/NNs/Likelihoods have similar sensitivity
- ▶ Multivariate analysis + shape information from output:
→ factor 2 better than simple cuts

Single top beyond the SM

Plethora of possibilities

- ▶ Wtb interaction: anomalous couplings, “beautiful mirrors”, top see-saw (little Higgs)
- ▶ New particles: 4th generation q , W' , H^\pm , SUSY, technicolor
- ▶ FCNC: probe tgu coupling (extends LEP limits because involves a g)
- ▶ Extra SU(2), Universal Extra Dimensions



No results yet from the Tevatron but we should discuss things that can be done and studied at the Tevatron in preparation for the LHC:

- Either because they won't be easily available
- Or because we can help prepare the way

Model independent limits

